Tianwei New Energy (Yangzhou) Co., Ltd.

Oversea Sales Center: Shanghai
Add: #2808-10, Tower B, No.100 Zunyi Rd,
Shanghai, China 200051
Sales: +86-21-61951391
Marketing: +86-21-61951395
Fax: +86-21-61951390

Headquarters: Yangzhou
Add: No.1,Tianwei Road, Economic & Technological
Development Zone of Yangzhou, Yangzhou City,
Jiangsu Province, China 225131
Tel: +86-514-85589583
Fax: +86-514-85589500

Sales: sales@twysolar.com Media: marketing@twysolar.com Website: www.twysolar.com

Engineering a Reliable Solar Future

Installation Manual

1. Introduction

This manual provides safety and installation instructions for TUV and UL-listed Tianwei New Energy photovoltaic (PV) modules carrying the TUV and UL logo on the product label.

This guide contains information regarding the installation and safe handling of Tianwei New Energy (Yangzhou) Co., Ltd photovoltaic module (hereafter is referred to as "module"). Tianwei New Energy (Yangzhou) Co., Ltd hereafter is referred to as "TWNE". Installers must read and understand the guide before installation. Any questions, please contact our sales department for further explanations. The installer should conform to all safety precautions in the guide and local codes when installing a module.

Before installing a solar photovoltaic system, installers should become familiar with the mechanical and electrical requirement for such a system. Keep this guide in a safe place for future reference (care and maintenance) and in case of sale or disposal of the modules.

1.1 Disclaimer of Liability

Because the use of this manual and the conditions or methods of installation, operation, use and maintenance of photovoltaic (PV) product are beyond TWNE's control, TWNE does not accept responsibility and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with such installation, operation, use or maintenance.

No responsibility is assumed by TWNE for any infringement of patents or other rights of third parties, which may result from use of the PV product. No license is granted by implication or otherwise under any patent or patent rights.

The information in this manual is based on TWNE's knowledge and experience and is believed to be reliable; but such information including product specification (without limitations) and suggestions do not constitute a warranty, expresses or implied. TWNE reserve the right to change the manual, the PV producets, the specifications, or product information sheets without prior notice.

***Warning*: Read this instruction sheet in its entirety before installing, wiring, or using this product in any way. Failure to comply with these instructions will invalidate the TWNE Limited Warranty for PV Modules.**

In summary, the Limited Warranties do not apply to any of the following;

PV modules which in TWNE's absolute judgment have been subjected to: misuse, abuse, neglect or accident; alteration, improper installation, application or removal (including but not limited to installation, application or removal by any party other than a TWNE authorized dealer; non-observance of TWNE's installation, users and/or maintenance instructions; repair or modifications by someone other than an approved service technician of TWNE; power failure surges, lightning, flood, fire, accidental breakage or other events outside TWNE's control.

2. General Safety precaution

- Before installing this device, read all safety instructions in this document.
- Installing solar photovoltaic systems may require specialized skills and knowledge. Installation should be performed only by qualified persons.
- Cover all modules in the PV array with an opaque cloth or material before making or breaking electrical connections.
- One individual module may generate DC voltages greater than 30 volts when exposed to direct sunlight. Contact with a DC voltage of 30V or more is potentially hazardous.
- Remove all metallic jewelry prior to installing this product to reduce the chance of accidental exposure to live circuits.
- Artificially concentrate sunlight shall be not be directly on the module.
- Do not disconnect under load.¾Do not stand on, drop, scratch, or allow objects to fall on modules.
- Installers should assume the risk of all injury that might occur during installation, including, without limitation, the risk of electric shock. ¾If the front glass is broken, or the back sheet is torn, contact with any module surface or module frame can cause electric shock.
- Photovoltaic solar modules change light energy to direct-current electrical energy. They are designed for outdoor use. Modules may be ground mounted, mounted on rooftops, vehicles or boats. Proper design of support structures is responsibility of the system designers and installers.
- Use insulated tools to reduce your risk of electric shock.
- Abide with the safety regulations for all other components used in the system, including wiring and cables, connectors, charging regulators, inverters, storage batteries and rechargeable batteries, etc.
- There are no user serviceable parts within the module. Do not attempt to repair any part of the module.
- Use only equipment, connectors, wiring and support frames suitable for a solar electric system. Always use the same type of module within a particular photovoltaic system.
- Broken j-boxes and/or broken connectors are electrical hazards as well as laceration hazards. The dealer or installers should remove the module from the array and contact the supplier for disposal instructions.
- Do not attempt to disassemble the modules, and do not remove any attached nameplates or components from the modules.
- Do not install or handle the modules when they are wet or during periods of high wind. ¾Do not apply paint or adhesive to module top surface.
- Contact your module supplier if maintenance is necessary.
- When installing the system, abide with all local, regional and national statutory regulations. Obtain a building permit where necessary.
- Save these instructions!

3. Mechanical Installation

The TWNE Limited Warranty for PV Modules is contingent upon modules being mounted in accordance with the requirements described in this section.

3.1 Site Considerations

TWNE modules should be mounted in locations that meet the following requirements:

Environment Conditions:

- Operating temperature: -40℃ to +85℃.
- Snowfall pressure: below 5400Pa.
- Wind pressure: below 2400Pa.
- The module frame is made of anodized aluminum, and therefore corrosion can occur if modules are

subject to a salt-water environment with contact to a rack of another type of metal. If required, PVC or stainless steel washers can be placed between the solar module frame and support structure to prevent this corrosion.

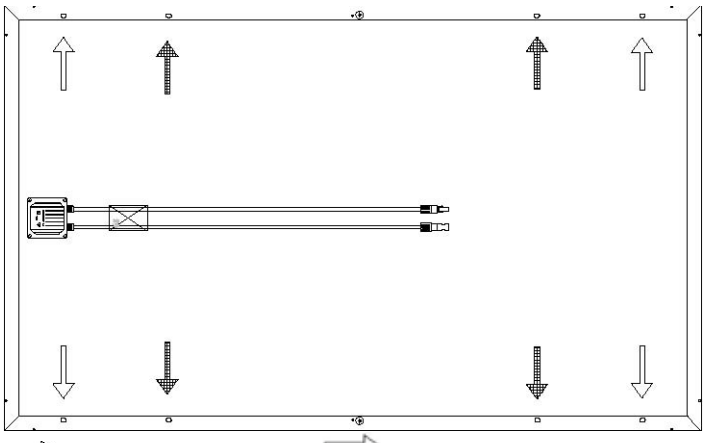
- Care should be taken to provide adequate ventilation behind the modules, especially in hot environments.

Selecting the location:

- Select a suitable location for installing the modules.
- The modules should be facing south in northern latitudes and north in southern latitudes.
- For detailed information on the best elevation tilt angle for the installation, refer to standard solar photovoltaic installation guides or a reputable solar installer or systems integrator.
- The module should not be shaded at any time of the day.
- Do not use module near equipment or in locations where flammable gases can be generated or collected.
- TWNE modules are designed to meet a maximum positive (or upward, e.g. wind) and negative (or downward, e.g. static load) design pressure of 50 lb/ft^2 when mounted in one of the mounting configurations specified in Section .3.2.
- When mounting modules in snow-prone or high-wind environments, special care should be taken to mount the modules in a manner that provides sufficient design strength while meeting local code requirements.

3.2 Mounting Configurations

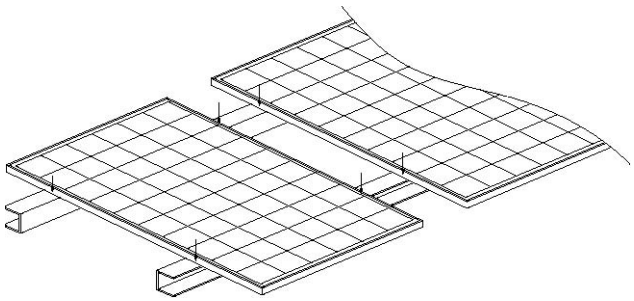
- Selecting the proper support frame
- Always observe the instructions and safety precautions included with the support frame to be used
- with the module.
- No attempt should be made to drill holes in the glass surface of the module. To do so will void the warranty.
- Do not drill additional mounting holes in the frame of the module. Doing so will void the warranty.
- Modules must be securely attached to the mounting structure using four mounting points for normal installation. If additional wind or snow loads are anticipated for this installation, additional mounting points are also used. Refer to the drawing, below. Load calculations are left to the system designer or installer.



Mounting holes for normal installation

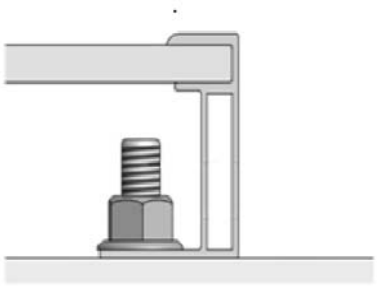
For strong wind and heavy snow-loads, these mounting holes must also be used

Each module must be securely fastened at a minimum of 4 points. The frame has been stress tested for mounting by the long sides.



Example A

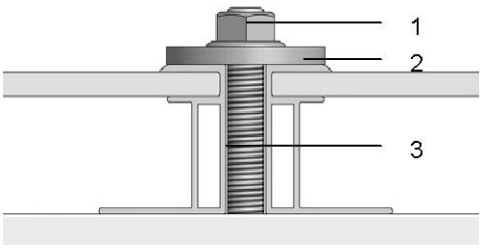
Screw fitting：PV modules can be mounted using M8 or 5/16 inch bolts by screwing (Example A) at the back side. In the examples A shown, Use the existing holes for securing the module.



Example B

Clamp fitting: TWXXXP60-FA

The clamping area (Example B) of the washer must cover at least 560 mm2. A torque wrench must be used for assembly. In the examples shown,the tightening torque (using stainless steel M8 or 5/16 inch bolts) must be 20 Nm or 11.8 ft-lbf.



1) Stainless steel serrated lock nut
2) Stainless steel washer
3) Stainless steel M8 (5/16 inch) T-head bolt

3.3Handling of Modules during Installation

Does not place modules face-forward in direct contact with abrasive surfaces like roofs, driveways, wooden pallets, railings, stucco walls, etc…. The module front surface glass is sensitive to oils and abrasive surfaces, which may lead to scratches and irregular soiling.

4. Electrical Connections

Modules may be connected in series and/or parallel to achieve the desired electrical output as long as certain conditions are met. Please use only the same type of modules in a combined source circuit.

4.1 Equipment Grounding

The module frame must be properly grounded. Ensure to comply with all local electrical codes and regulations.

- The earth grounding connection should be made by a qualified electrician.
- Ground holes have been identified with the grounding tab.
- Using a terminal connector to make sure that the grounding wire well connected , and the grounding wire must be fastened to the module frame.

- All the junctions on the conductive connection must be fixed. Metal containing iron in the conductive connection should be treated against corrosion to prevent rusting and corrosion.

4.2 Junction Box and Terminals

- Modules equipped with one junction box contain terminals for both positive and negative polarity, and bypass diodes.
- One terminal is dedicated to each polarity (with the polarity symbols engraved onto the body of the junction box)

4.3 Conduit

- For applications where wire conduits are used, follow the applicable codes for outdoor installation of wires in conduits.
- Verify that all fittings are properly installed to protect wires against damage and prevent moisture intrusion.

4.4 Bypass Diodes

- When the modules in series strings are shaded partially, it may cause reverse voltage across cells or modules, because the current from other cells in the same series is forced to flow through the shaded area. This may cause undesirable heating to occur.
- The use of a diode to bypass the shaded area can minimize both heating and array current reduction.
- All TWNE modules are equipped with factory installed bypass diodes. The factory-installed diodes provide proper circuit protection for the systems within the specified system voltage, so that you do not need any other additional bypass diodes.
- Contact your TWNE Authorized Representative for proper diode type, if it is necessary to add or change diodes due to system specifications.

4.5 General Electrical Connections

- Do not use modules of different configurations in the same system. The max number of module (N) = Vmax system / [Voc (at STC)].
- Under normal operating conditions, solar photovoltaic modules will produce currents or voltages that are different from those listed in the date sheet. Data sheet values are applicable at standard test data. Therefore short-circuit current and open-circuit voltages should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor current rating, fuse sizes and size of controls connected to the module or system output.
- Several modules are connected in series and then in parallel to form a PV array, especially for application with a high operation voltage. If modules are connected in series, the total voltage is equal to the sum of individual voltages.
- For applications requiring high currents, several photovoltaic modules can be connected in parallel; the total current is equal to the sum of individual currents.
- Module is supplied with connectors to use for system electrical connections.
- Consult rated local wiring regulations to determine system wire size, type, and temperature.
- The cross section area of cable and the capacity of connector must be selected to suit the maximum system short circuit current(Recommended cross section area of cable is 4mm^2 for a single module and rated current of a connector is larger than 10A), otherwise the cable and connector will be overheated under large current. Please note that the upper limit temperature of cable is ≥85℃,and the connector is ≥105℃
- The junction box has a breather port. The breather port must be mounted facing down and cannot be exposed to rain. Therefore, the junction box must be on the higher side of the module when it is mounted.

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5. Maintenance

- Some maintenance is recommended to maintain optimal output performance of the solar modules.
- If the module surface becomes dirty, it may reduce output power.
- It is recommended to clean the surface of the module with water and a soft cloth or sponge, twice or more per year.
- A mild non-abrasive detergent may be applied for persistent dirt.
- It is also recommended to inspect the electrical and mechanical connections annually.
- If you need electrical or mechanical inspection or maintenance, it is recommended to have a licensed authorized professional carry out the inspection or maintenance to avoid the hazards of electric shock or injury.